

Curriculum Vitae

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EDUCATION

2005 August – April 2008 **Ph.D.** Biosystems Engineering and Soil Science, University of Tennessee (UT), Knoxville, TN, USA.
2002 September – January 2004 **M.S.** Geological Engineering Department, Middle East Technical University (METU), Ankara, Turkey.
1997–2002 **B.S.** Hydrogeological Engineering Department, Hacettepe University, Ankara, Turkey.

WORK EXPERIENCES

August 2012 – ..., Geological Scientist, Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley CA, USA
August 2010 – August 2012, Postdoctoral Fellow, Earth Sciences Division, Lawrence Berkeley National Laboratory, Berkeley CA, USA
April 2008 –August 2010, Postdoctoral Research Associate, Center for Experimental Study of Subsurface Environmental Processes, Environmental Science and Engineering, Colorado School of Mines. Golden, CO, USA
August 2005 – April 2008, Research Assistant, Biosystems Engineering & Soil Science, University of Tennessee, Knoxville, TN, USA

PUBLICATIONS

Cihan, A., J. Birkholzer, T. H. Illangasekare, and Q. Zhou (2014). A modeling approach to represent hysteresis in capillary pressure-saturation relationship based on fluid connectivity in void space, *Water Resour. Res.*, 50, doi:10.1002/2013WR014280.

Cihan, A., Q. Zhou, J. T. Birkholzer, and S. R. Kraemer (2013), Flow in horizontally anisotropic multilayered aquifer systems with leaky wells and aquitards, *Water Resour. Res.*, 50, doi:10.1002/2013WR013867.

Birkholzer, J.T., **A. Cihan**, K. Bandilla, (2013). A tiered area-of-review framework for geologic carbon sequestration. *Greenhouse Gas Science and Technology*, 1-16, 2013.

Smits, K. M., **Cihan A.**, T. Sakaki, S. Howington, J. Peters and T. H. Illangasekare, (2013), Soil Moisture and Thermal Behavior in the Vicinity of Buried Objects Affecting Remote Sensing Detection: Experimental and Modeling Investigation, *IEEE Transactions on Geoscience and Remote Sensing*, 51(5), 2675-2688, DOI: 10.1109/TGRS.2012.2214485.

Sakaki, T., P. E. Schulte, **A. Cihan**, J. A. Christ, and T. H. Illangasekare, (2013), Airflow pathway development as affected by soil moisture variability in heterogeneous soils, *Vadose Zone Journal*, doi:10.2136/vzj2011.0118.

Cihan, A., J. Birkholzer, and Q. Zhou (2012), Pressure Buildup and Brine Migration during CO₂ Storage in Multilayered Aquifers, *Ground Water*, doi: 10.1111/j.1745-6584.2012.00972.x

- Birkholzer, J., **A. Cihan**, and Q. Zhou (2012), Impact-Driven Pressure Management via Targeted Brine Extraction – Concept studies of CO₂ storage in saline formations with leakage pathways, *International Journal of Greenhouse Gas Control*, 7, 168.
- Smits, K. M., V. V. Ngo, **A. Cihan**, T. H. Illangasekare, and T. Sakaki, (2012), An evaluation of models of bare soil evaporation formulated with different land surface boundary conditions and assumptions, *Water Resour. Res.*, 48, W12526, doi:10.1029/2012WR012113.
- Smits, K. M., **A. Cihan**, V. V. Ngo, and T. H. Illangasekare (2012), Reply to comment by Michael D. Novak on “Evaporation from soils under thermal boundary conditions: Experimental and modeling investigation to compare equilibrium and nonequilibrium based approaches”, *Water Resour. Res.*, 48, W05550, doi:10.1029/2011WR011609.
- Sakaki, T., A. Limsuwat, **A. Cihan**, C. C. Frippiat, and T. H. Illangasekare, (2012), Water retention in a coarse pocket under wetting and drainage, *Vadose Zone Journal*, 11:223-230, doi:10.2136/vzj2011.0028.
- Cihan, A.**, Q. Zhou and J. Birkholzer, (2011), Analytical Solutions for Pressure Perturbation and Fluid Leakage through Aquitards and Wells in Multilayered Aquifer Systems, *Water Resources Research*, doi:10.1029/2011WR010721.
- Cihan, A.** and J. S. Tyner (2011), 2-D radial analytical solutions for solute transport in a dual porous medium, *Water Resources Research*, 47, W04507, doi:10.1029/2009WR008969.
- Smits, K. M., **A. Cihan**, T. Sakaki, and T. H. Illangasekare, (2011), Heat-induced evaporation in the shallow subsurface: Experimental and Modeling investigation, *Water Resources Research*, 47, W05540, doi:10.1029/2010WR009533.
- Phenrat, T., **A. Cihan**, K. Hye-Jin, M. Menka, T. Illangasekare, G. V. Lowry (2010), Transport and deposition of Polymer-modified Fe₀ Nanoparticles in 2-D Heterogeneous Porous Media: Effects of Particle Concentration, Fe₀ Content, and Coatings, *Environmental Sciences and Technology*, 44(23), 9086-9093.
- Cihan, A.**, M. Sukop, J. S. Tyner, E. Perfect, and H. Huang, (2009), Analytical and Lattice Boltzmann Predictions of Intrinsic Permeability for Mass Fractal Porous Media, *Vadose Zone Journal*, 8(1): 1-10.
- Cihan, A.**, J. S. Tyner, and E. Perfect, (2009), Predicting Relative Permeability from water retention: A direct approach based on fractal geometry, *Water Resources Research*, 45, doi:10.1029/2008WR007038.
- Cihan, A.**, and M. Y. Corapcioglu (2008), Effect of compressibility on the rise velocity of an air bubble in porous media, *Water Resources Research*, 44, W04409, doi:10.1029/2006WR005415.
- Cihan, A.**, E. Perfect, and J. S. Tyner (2007), Water Retention Models for Scale-Variant and Scale-Invariant Drainage of Mass Prefractal Porous Media, *Vadose Zone Journal*, 6: 786-792.
- Cihan, A.**, J. S. Tyner, and W. Wright (2006), Seal Formation Mechanism beneath Animal Waste Holding Ponds, *Transactions of the ASABE*, 49(5): 1539-1544.
- Corapcioglu, M. Y., **A. Cihan**, and M. Drazenovic (2005), Hydrodynamics of an air bubble motion in porous media, *Poromechanics III - BIOT CENTENNIAL (1905–2005)*, edited by Y.N. Abousleiman, A.H.-D. Cheng, and F.-J. Ulm, April, University of Oklahoma, Oklahoma, USA.
- Corapcioglu, M. Y., **A. Cihan**, and M. Drazenovic (2004), Rise velocity of an air bubble in porous media: Theoretical studies, *Water Resources Research*, 40, W04214, doi:10.1029/2003WR002618.

SCHOLARSHIPS and AWARDS

- As one of the best graduate students with professional promise in Biosystems Engineering, recognized and awarded by the faculty of the Biosystems Engineering and Soil Science Department, April 2008.
- Travel and expenses grant to attend the Kirkham Conference, University of California Davis in February 24-26th, 2008.

- Graduate Student Travel fund to attend the 2007 American Geophysical Union Fall meeting, by Office of the Dean of Students, University of Tennessee
- Scholarship (tuition, board, and lodging) for attending The Summer School in Geophysical Porous Media, funded by The National Science Foundation (NSF), Purdue University in July 17-28th, 2006.
- The Scientific and Technical Research Council of Turkey, TUBITAK Graduate Student Scholarship (2004).

ABSTRACT AND PRESENTATIONS

- Cihan, A.**, J.T. Birkholzer, M. Bianchi, L. Trevisan, Q. Zhou, T. Illangasekare, (2014), A Connectivity-Based Upscaling Approach for Modeling Two-Phase Flow in Heterogeneous Geological Formations, 12th International Conference on Greenhouse Gas Control Technologies, November 2014, Austin, TX, 2014.
- Birkholzer, J.T., **A. Cihan**, M. Bainchi, (2014), Targeted Pressure Management during CO₂ Sequestration: Optimization of Well Placement and Brine Extraction in a Heterogeneous Reservoir, 12th International Conference on Greenhouse Gas Control Technologies, November 2014, Austin, TX, 2014.
- Birkholzer, J.T., **A. Cihan**, M. Bainchi, (2013), Optimization of Well Placement and Brine Extraction for Pressure Control Along Critically Stressed Faults, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014.
- Birkholzer, J.T., **A. Cihan**, K. Bandilla, (2013), A Tiered Area-of-Review Framework for Geologic Carbon Sequestration, 13th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 28-May 1, 2014.
- Cihan, A.**, J.T. Birkholzer, T. Illangasekare, Q. Zhou, (2013), A Theoretical Approach Representing Hysteresis in Capillary Pressure-Saturation Relationship Based on Connectivity in Void Space, AGU Fall Meeting 2013, San Francisco, CA, December, 2013.
- Cihan, A.**, J.T. Birkholzer, M. Bianchi, Q. Zhou, (2013), A New Connectivity-Based Upscaling Methodology for Multi-Scale Two-Phase Flow Processes in Heterogeneous Geological Formation, Abstract submitted to 12th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, May 13-16, 2013.
- Agartan, E., T. Illangasekare, **A. Cihan**, J.T. Birkholzer, Q. Zhou, L. Trevisan, (2013), Investigation of Multi-Phase Modeling Approaches for Behavior of Supercritical CO₂ in Deep Formations Using Analog Fluids in the Laboratory, Abstract submitted to Modflow and More Conference 2013, Golden, CO, June 2013.
- Trevisan, L., A. Cihan, T. Illangasekare, E. Agartan, H. Mori, J.T. Birkholzer, Q. Zhou, (2013), A Fundamental Study of Convective Mixing of CO₂ in Heterogeneous Geologic Media using Surrogate Fluids and Numerical Modeling, Abstract submitted to Modflow and More Conference 2013, Golden, CO, June 2013.
- Agartan, E., T. Illangasekare, **A. Cihan**, J.T. Birkholzer, Q. Zhou, L. Trevisan, (2013), A Fundamental Study of Convective Mixing Contributing to Dissolution Trapping of CO₂ in Heterogeneous Geologic Media using Surrogate Fluids and Numerical Modeling, Abstract submitted to European Geophysical Conference, Vienna, Austria, April 2013.
- Birkholzer, J.T., **A. Cihan**, Q. Zhou, (2012), Impact-Driven Pressure Management Via Targeted Brine Extraction – Conceptual Studies on Reservoir Performance Optimization, Abstract in Proceedings 11th Annual Conference on Carbon Capture, Utilization and Sequestration, Pittsburgh, PA, April 30 – May 3, 2012.
- Illangasekare, T.H., Trevisan, L., Rodriguez, D., Sakaki, T., **Cihan, A.**, Birkholzer, J.T., Zhou, Q, (2012), Multiple scale physical and numerical modeling for improved understanding of mechanisms of trapping and leakage of CO₂ in deep geologic formations, Abstract submitted to EGU 2012 Meeting, Vienna, Austria, April 22-27, 2012.

- Cihan, A.**, Zhou, Q., Birkholzer, J.T., (2011), Analytical Solutions for Pressure Perturbation and Fluid Leakage through Aquitards and Wells in a Multilayered System, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract H33G-1401.
- Smits, K. M., V.V. Ngo, **A. Cihan**, T. Sakaki, T. H. Illangasekare, (2011), An Experimental and Modeling Study of Evaporation from Bare Soils Subjected To Natural Boundary Conditions At The Land-Atmospheric Interface, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract H41J-01.
- J. Birkholzer, **A. Cihan**, and Q. Zhou (2011), Impact-Driven Pressure Management For Leaky CO₂ Storage Systems, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract H41K-02.
- Cihan, A.**, J.T. Birkholzer, Q. Zhou, L. Trevisan, T.H. Illangasekare, D. Rodriguez, T. Sakaki, (2011), A Numerical Modeling Study of Effect of Heterogeneity on Capillary Trapping of Geologically Sequestered CO₂, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract H54D-02.
- Trevisan, L. T.H. Illangasekare, D. Rodriguez, T. Sakaki, **A. Cihan**, J.T. Birkholzer, Q. Zhou, (2011), Experimental methods for the simulation of supercritical CO₂ injection at laboratory scale aimed to investigate capillary trapping, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract H51G-1280.
- Cihan, A.**, Zhou, Q., Birkholzer, J.T., (2011), Analytical Solutions for Pressure Perturbation and Leakage through Aquitards and Wells in Multilayered Aquifer-Aquitard Systems, Geological Society of America Abstracts with Programs, Vol. 43, No. 5, p. 81, GSA Annual Meeting in Minneapolis, 9-12 October.
- Cihan, A.**, Zhou, Q., Birkholzer, J.T., (2011), Analytical Solutions for Leakage through Aquitards and Abandoned Wells in Multilayered Aquifer-Aquitard Systems, submitted to 10th Annual Conference on Carbon Capture and Sequestration, Pittsburgh, PA, May 2-5, 2011.
- Illangasekare, T.H., Smits, K., Sakaki, T., **Cihan, A.**, (2011), Soil Moisture Processes in the Shallow Subsurface Near Land/Atmospheric Interface-Challenges and New Research Approaches, Geophysical Research Abstracts, Vol. 13, EGU2011-4853.
- Trevisan, L., Illangasekare, T.H., Rodriguez, D., Sakaki, T., **Cihan, A.**, Birkholzer, J.T., Zhou, Q., (2011), Improved Understanding of Migration and Entrapment of Supercritical CO₂ in Deep Geologic Formations: Intermediate Scale Testing and Modeling, MODFLOW 2011 Meeting, Golden, CO, June 5-8, 2011.
- Illangasekare, T.H., Trevisan, L., Rodriguez, D., Sakaki, T., **Cihan, A.**, Birkholzer, J.T., Zhou, Q., (2011), A Fundamental Study of Migration and Entrapment of Supercritical CO₂ in Heterogeneous Deep Geologic Formations: Intermediate Scale Testing and Modeling, submitted to EGU 2011 Meeting, Vienna, Austria, April 10-14, 2011.
- Smits, K., **Cihan A.**, Sakaki T., and Illangasekare T. H., (2011), Numerical Simulation on the Effect of Heterogeneity on Evaporation/Condensation in Soils, MODFLOW 2011 Meeting, Golden, CO, June 5-8, 2011
- Sakaki, T., Schulte P. E., **A. Cihan**, J. E. Chirst, and T. H. Illangasekare, (2011), Airflow pathway dynamics in heterogeneous subsurface influenced by land surface boundary conditions, MODFLOW 2011 Meeting, Golden, CO, June 5-8, 2011
- Cihan A.**, T. Illangasekare, J. Birkholzer, Q. Zhou, and R. Derrick, (2010), Intermediate-Scale Investigation of Capillary and Dissolution Trapping during CO₂ Injection and Post-Injection in Heterogeneous Geological Formations, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract.
- Smits, K. M. **Cihan A.**, Sakaki T., and Illangasekare T. H., (2010), Evaporation from Soils Under Thermal Boundary Conditions: Experimental and Modeling Investigation to Compare Equilibrium and Non-equilibrium Based Approaches, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract
- Illangasekare, T. H., Sakaki, T., Schulte P. E., **A. Cihan**, J. E. Chirst, (2010), Air Flow Path Dynamics in the Vadose Zone Under Various Land Surface Climate Boundary Conditions, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract
- Mittal, M., Phenrat T., Fagerlund F., Kim H., **Cihan A.**, Lowry G. V., Illangasekare T., (2009), Use of an Intermediate-Scale Tank to Study Strategies for Modified NZVI Emplacement for Effective Treatment of DNAPL Source Zones, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract

- Smits, K. M. **Cihan A.**, Sakaki T., and Illangasekare T. H., (2009), Heat-induced evaporation in the shallow subsurface: Experimental and Modeling investigation, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract
- Cihan, A.**, T. Phenrat, Illangasekare, T, and G. V. Lowry, (2009), Modeling Tools to Design in Situ Nanoscale Zerovalent Iron (NZVI) Emplacement Strategies, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract.
- Illangasekare, T, T. Phenrat, **A. Cihan**, and G. V. Lowry, (2009), Roles of Particle Properties, Subsurface Geochemical/Geophysical/ Hydrological Conditions, and Delivery Strategies on the Emplacement of Polymeric Modified Nanoscale Zerovalent Iron (NZVI) for In situ Subsurface Remediation, *Eos Trans. AGU*, 90(22), Jt. Assem. Suppl., Abstract H34A-03
- Dean, D., T. Illangasekare, **A. Cihan**, (2008), Use of Stochastic Differential Equation Solution Methods for Bubble Migration in Porous Media, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abstract H31F-0941
- Illangasekare, T. H., Fagerlund, F., Mittal, M., **Cihan, A.**, Lowry, G. V., Phenrat, T., Kim, H., (2008), Effects of DNAPL source Morphology on Contaminant Mass Transfer and the Zone of Effective Treatment Using Nano-Scale Zero-Valent Iron, *Eos Trans. AGU*, Fall Meet. Suppl., Abstract
- Tyner, J. S., **A. Cihan**, J. Lee, and R. W. Gentry, (2007), A Preliminary Description of the Moisture Moment Method to Describe Unsaturated Soil Hydraulic Properties, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract H53F-1491
- Cihan, A.**, J. S. Tyner, M. Sukop, E. Perfect, and H. Haibo, (2007), Analytical and Lattice Boltzmann Predictions of Intrinsic Permeability for Deterministic and Randomized Fractal Porous Media, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract H53E-1465
- Cihan, A.**, J. S. Tyner, and W. C. Wright, (2005), Seal Formation Mechanism Beneath Animal Waste Holding Ponds, *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abstract H21E-1401

PROJECTS

- "National Risk National Risk Assessment Partnership (NRAP) Project" funded by Office of Research and Development of the U.S. Dept. of Energy. NRAP involves five DOE National Labs. My specific role in this project focuses on upscaling multiphase flow of injected CO₂ and reservoir fluids in heterogeneous geological formations and predicting long term trapping.
- "Large-Scale Hydrological Impacts of CO₂ Geological Storage" funded by the Assistant Secretary for Fossil Energy, Office of Sequestration, Hydrogen, and Clean Coal Fuels, National Energy Technology Laboratory (NETL), of the U.S. Dept. of Energy, and by Lawrence Berkeley National Laboratory under Contract No. DE-AC02-05CH11231. The project is jointly coordinated by NETL and the U.S. Environmental Protection Agency.
- "Consolidated Sequestration Research Project (CSRP)" funded by the Assistant Secretary for Fossil Energy, Office of Sequestration, Hydrogen, and Clean Coal Fuels, National Energy Technology Laboratory, of the U.S. Department of Energy
- "Intermediate Scale Testing to Understand Mechanisms of Capillary and Dissolution Trapping during Injection and Post-Injection of CO₂ in Heterogeneous Geological Formations" Funded by the Assistant Secretary for Fossil Energy, Office of Sequestration, Hydrogen, and Clean Coal Fuels, National Energy Technology Laboratory, of the U.S. Department of Energy, and by Lawrence Berkeley National Laboratory under Contract No. DE-AC02-05CH11231.

“Fundamental Study of Processes Associated with Stable Trapping and Potential Leakage of Sequestered Carbon Dioxide in Deep Geologic Formations” Funded by Division of Earth Sciences, National Science Foundation (NSF), Award number-**1045282**

“Vapor Intrusion from Entrapped NAPL Sources and Groundwater Plumes” funded by the U. S. Army Research Office Award W911NF-04-1-0169, and Strategic Environmental Research and Development Program (SERDP) ER-1687

"Land Mine Detection by Using Thermal and Moisture Content Anomalies in shallow subsurface" funded by the U. S. Army Research Office Award W911NF-04-1-0169, the Engineering Research and Development Center (ERDC).

“Fundamental study of delivery of nanoiron to DNAPL source zones in naturally heterogeneous field systems, SERDP”: This project involves experimental and theoretical methods to understand Nano-iron transport associated with DNAPL source zone remediation. The project was completed in May 2010.

“Enhanced Gas Production from Coal: Modeling, Model Validation and Upscaling, Center for Experimental Study of Subsurface Environmental Processes, funded by Ciris Energy”: Development of a numerical code to simulate governing processes during gas production from coal such as desorption, dissolution, bacterial attachment, chemical species transport, and bubble formation. This code was delivered to CIRIS Energy, and the project was completed in April 2009.

“Piceance Basin Groundwater Flow Model Development and Calibration, funded by Chevron”: Conduct parallel computations of PEST inverse modeling software to calibrate groundwater flow model of Piceance Basin. Project was completed in December 2009.

“The rise velocity of air bubbles and transport of volatile organic compounds in gravel during the Air Sparging Operations, funded by The Scientific and Technological Research Council of Turkey”, 2004 – 2006.

MANUSCRIPT REVIEWER

Water Resources Research
Chemical Engineering Science
Transport in Porous Media
Advances in Water Resources

MEMBERSHIP

American Geophysical Union (AGU)
Gamma Sigma Delta
American Association for the Advancement of Science (AAAS)